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DOE STANDARD

FIRE PROTECTION ENGINEERING FUNCTIONAL AREA QUALIFICATION STANDARD

DOE Defense Nuclear Facilities Technical Personnel



**U.S. Department of Energy
Washington, D.C. 20585**

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APPROVAL

The Federal Technical Capability Panel consists of senior U. S. Department of Energy (DOE) managers responsible for overseeing the Federal Technical Capability Program. This Panel is responsible for reviewing and approving the Qualification Standard for Department-wide application. Approval of this Qualification Standard by the Federal Technical Capability Panel is indicated by signature below.



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FEDERAL TECHNICAL CAPABILITY PANEL

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ACKNOWLEDGMENT

The U.S. DOE, National Nuclear Security Administration (NNSA) is the sponsor for this Fire Protection Engineering Functional Area Qualification Standard (FAQS). The sponsor is responsible for coordinating the development and/or review of the FAQS by subject matter experts to ensure that the technical content of the Standard is accurate and adequate for Department-wide application for those involved in the Fire Protection Engineering program. The sponsor, in coordination with the Federal Technical Capability Panel, is also responsible for ensuring the FAQS is maintained current.

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**U.S. DEPARTMENT OF ENERGY
FUNCTIONAL AREA QUALIFICATION STANDARD (FAQS)**

FIRE PROTECTION ENGINEERING

PURPOSE

DOE Order (O) 426.1 Chg. 1, *Federal Technical Capability*, commits the Department to continuously strive for technical excellence. The Technical Qualification Program (TQP), along with the supporting technical qualification standards, complements the personnel processes that support the Department's drive for technical excellence. In support of this goal, the competency requirements defined in the technical qualification standards should be aligned with and integrated into the recruitment and staffing processes for technical positions. The U.S. Office of Personnel Management (OPM) minimum qualifications standards will be greatly enhanced by application of appropriate materials from the FAQS.

The primary purpose of the TQP is to ensure that employees have the requisite technical competency to support the mission of the Department. The TQP forms the basis for the development and assignment of DOE personnel responsible for ensuring the safe operation of defense nuclear facilities. The technical qualification standards are not intended to replace the OPM qualifications standards nor other Departmental personnel standards, rules, plans, or processes. However, the technical qualification standards should form the primary basis for developing vacancy announcements, qualification requirements, crediting plans, interviewing questions, and other criteria associated with the recruitment, selection, and internal placement of technical personnel.

APPLICABILITY

Fire protection engineers use science and technology to evaluate the effects of fires to protect workers, public, people, environment, and property. They analyze how facilities are used, how fires start and grow, and how fire and smoke affect people, buildings and property. Fire protection engineers evaluate many facets of the fire protection field. These include preventing and/or reducing fire consequences, reducing loss of life and property impacts of fire by applied engineering fundamentals, research, fire hazard analyses, design of fire protection/prevention systems for industrial and nuclear complexes and processes, detection and suppression of fires, fire investigation, controls for flammable and combustible liquids, unique pyrophoric materials, other highly volatile materials, public and industrial fire department organizations, fire department incident command systems, emergency medical requirements, fire ground tactics, confined space requirements, and hazardous material responses. As a result of fire being a dominant risk in nuclear facilities, fire protection engineers must be familiar with industry technical codes, standards, and practices to ensure DOE liabilities are protected from the inherent risks of fire. This includes knowledge of and participation in activities that ensure nuclear fire safety including the review of safety analysis reports, safety evaluation reports, technical safety requirements, unreviewed safety question process, the acceptance of administrative controls, and hazard categorization and accident analysis techniques. In addition, since DOE fire safety programs include critical parameters related to emergency services, fire protection engineers must possess the competencies for oversight of fire department operations related to the program, including the technical basis governing the baseline needs assessment

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and contents of the relevant National Fire Protection Association (NFPA) codes and standards. DOE-O-426.1 Chg.1, states that “DOE offices and organizations must ensure that their Federal employees are appropriately trained and technically capable of carrying out their responsibilities.” DOE-O-420.1C and DOE-STD-1066-2012 specify the functional responsibilities for DOE fire protection programs. This FAQS is necessary to provide reasonable assurance that these fire safety and emergency services-related responsibilities are being performed by appropriately qualified individuals. The Department also recognizes a need to define a separate category of competencies for Federal engineers who are assigned safety system oversight of specific fire protection systems but provide no other related fire protection engineering oversight functions.

The Fire Protection Engineering FAQS establishes common functional area competency requirements in Sections I and II for all DOE fire protection engineers who provide a wide variety of duties related to fire safety and fire protection engineering including assistance, direction, guidance, oversight, or evaluation of contractor technical activities that could impact the safe operation of DOE’s defense nuclear facilities. Section III also includes competencies for engineers assigned to conduct oversight of specific safety-related fire protection system(s) but perform no other fire protection engineering responsibilities. The technical FAQS has been developed as a tool to assist DOE Program and Field Offices in the development and implementation of the TQP in their organization. For ease of transportability of qualifications between DOE elements, Program and Field Offices must use this FAQS without modification or addition to competency statements or Knowledge, Skills and Abilities (KSA’s). Additionally, needed office-/site-/facility-/specific qualification standards, handled separately, supplement this technical FAQS and establish unique operational competency requirements at the headquarters or field element, site, or facility level. Additional field element competencies may include: Site fire water supply; Locations where safety class or safety significant fire protection systems are provided; Types of fire protection systems employed at the site; Contractor’s fire protection program; Procedure for processing exemptions and equivalencies; Differing professional opinion process; Hazard category of key nuclear and radiological facilities; Fire department operations; process by which safety basis documents are reviewed and approved; or other. When coupled with OPM requirements, satisfactory and documented attainment of the competency requirements contained in this technical FAQS (see the Federal Technical Capability Program Directives and Standards page at <http://www.hss.energy.gov/deprep/ftcp/directives/directives.asp> for an example of the Fire Protection Engineering FAQS qualification card) ensures that personnel possess the minimum requisite competence to fulfill their functional area duties and responsibilities common to the DOE complex. Additionally, field element-specific qualification standards supplement this technical FAQS and establish unique operational competency requirements at the Headquarters or field element, site, or facility level.

It should be noted that the competency elements of management and leadership, general technical knowledge, regulations, administrative capability, and assessment and oversight are all embodied in the competencies listed in this standard. All of the factors above have a bearing on safety. Although the focus of this standard is technical competence, elements, such as, good communication, recognized credibility, ability to listen and process information, and the ability to guide an effort to get it right the first time are recognized as important aspects of safety.

If this FAQS is used as a guide for DOE contractors in the implementation of their fire protection programs, note that fundamental fire protection engineering knowledge and skills are not covered in this standard since they are covered by OPM requirements for Federal personnel. If

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used for contractor staff, competencies related to fundamental knowledge and skills must be added, commensurate with scope of their responsibility.

IMPLEMENTATION

This FAQS identifies the minimum technical competency requirements for DOE fire protection engineers in Sections I and II. The Department also recognizes a need to define a separate category of competencies for DOE engineers who are assigned safety system oversight of specific fire protection systems but provide no other related fire protection engineering oversight functions. The competencies for these candidates are addressed in this FAQS in Section III. Fire protection engineers who are also assigned safety system oversight of specific fire protection systems are expected to complete Section I, Section II and Competency 12. Although there are other competency requirements associated with the positions held by DOE personnel, this FAQS is limited to identifying the specific, common technical competencies required throughout all defense nuclear facilities. The competency requirements define the expected knowledge and/or skill that an individual must meet. Each of the competency requirements is further described by a list of supporting knowledge and/or skill statements that describe the intent of the competency statement(s). The supporting knowledge and/or skill statements for each competency requirement are provided to challenge the employee in the breadth and depth of his/her understanding of the subject matter. In selected competencies, expected knowledge and/or skills have been designated as “mandatory performance activities.” In these competencies, the actions are not optional.

The term “must” denotes a mandatory requirement, “should” denotes a recommended practice that is not required, and “may” denotes an option in this standard.

The competencies identify various levels of knowledge; or they require the individual to “**Demonstrate the ability**” to perform a task or activity as defined by supporting KSAs. These levels are further defined as follows:

Familiarity level is defined as basic knowledge of or exposure to the subject or process adequate to discuss the subject or process with individuals of greater knowledge.

Working level is defined as the knowledge required to monitor and assess operations/activities, to apply standards of acceptable performance, and to recognize the need to seek and obtain appropriate expert advice (e.g., technical, legal, safety) or consult appropriate reference materials required to ensure the safety of DOE activities.

Demonstrate the ability is defined as the actual performance of a task or activity in accordance with policy, procedures, guidelines, and/or accepted industry or DOE practices.

Mandatory performance activities are performed factors that require the candidate to perform a specific and discrete task to determine an understanding of the associated competency.

Competency Mandatory Performance Activities specified as a supporting knowledge and/or skill must be individually considered and met by TQP participants with qualifying official approval/sign-off. For example, “lead or participate in an assessment of a site or facility’s implementation of integrated safety management” or “complete and pass the Federal

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Emergency Management Administration (FEMA) Emergency Management Institute IS-00700 'National Incident Management System (NIMS) and Introduction' course".

NOTE: Supporting knowledge and/or skill statements should be considered by qualifying officials in the sign-off of individual competencies, however all of the listed Knowledge, Skills and Abilities to be met for an individual competency are determined by the TQP participant's supervisor and qualifying official to satisfy the competency.

Headquarters and field elements shall establish a program and process to ensure that DOE fire protection engineers and engineers who conduct fire-related safety system oversight possess the competencies required of their position. That includes the competencies identified in this technical FAQs. Documentation of the completion of the requirements of the Standard shall be included in the employee's training and qualification record. Satisfactory attainment of the competency requirements contained in this technical FAQs may be documented using the example Fire Protection Engineering FAQs qualification card that can be obtained from the Federal Technical Capability Program Directives and Standards page at <http://www.hss.energy.gov/deprep/ftcp/directives/directives.asp>.

Equivalencies should be used sparingly and with the utmost rigor and scrutiny to maintain the spirit and intent of the TQP. Equivalencies may be granted for individual competencies based on objective evidence of previous education, training, certification, or experience. Objective evidence includes a combination of transcripts, certifications, and in some cases, a knowledge sampling through a written and/or oral examination. Equivalencies shall be granted in accordance with the TQP Plan of the site/office/Headquarters organization qualifying the individual. The supporting knowledge and/or skill statements should, and mandatory performance activities must, be met before granting an equivalency for a competency.

Training shall be provided to employees in the TQP who do not meet the competencies contained in this technical FAQs. Training may include, but is not limited to, formal classroom and computer-based courses, self-study, mentoring, on the job training, and special assignments. Departmental training must be based on appropriate supporting knowledge and/or skill statements similar to the ones listed for each of the competency requirements. Headquarters and field elements should use the supporting knowledge and/or skill statements as a basis for evaluating the content of any training.

EVALUATION REQUIREMENTS

Attainment of the competencies listed in this technical FAQs should be documented in accordance with the TQP Plan or Policy of the site/office/headquarters organization qualifying the individual and the requirements in DOE M 360.1C, *Federal Employee Training*, and DOE O 426.1 Chg. 1, *Federal Technical Capability*.

The Qualifying Official (QO) or immediate supervisor should ensure that the candidate meets the background and experience requirements of this FAQs. The QO should be qualified in the fire protection FAQs and ensure a thorough evaluation of the candidates knowledge. Supervisors who are not qualified fire protection engineers should obtain the services of a qualified fire protection QO to evaluate and document the candidate's successful completion of the required competencies. Unless stated otherwise within the program or site TQP Plan, attainment of the competencies listed in the Fire Protection Engineering FAQs should be evaluated and documented by either a QO or immediate supervisor using a combination of the following methods.

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- Satisfactory completion of a written examination
- Satisfactory completion of an oral examination
- Satisfactory accomplishment of an observed task or activity directly related to a competency; or
- Documented evaluation of equivalencies (such as professional certifications (PE, NICET, CFPS), an advanced degree by an accredited fire protection education program, or applicable experience in the field)

If a qualified Fire Protection Engineer (FPE) Qualifying Official (QO) is not available at the candidate's duty station location, the Supervisor should consider using the services of fire protection QOs from other DOE sites. The Federal Technical Capability Panel/Agents may be consulted to assist in obtaining needed qualifying official resources from other sites. This function can be performed remotely via computer, email, teleconferencing, video conferencing, etc.

Field element managers/headquarters program managers must qualify candidates as possessing the basic technical knowledge, technical discipline competency, and position-specific knowledge, skills, and abilities required for their positions.

Final qualification of candidates must be performed using one or a combination of the following methods:

- Satisfactory completion of a comprehensive written examination with a minimum passing score of 80 percent;
- Satisfactory completion of an oral examination by a qualified STSM or a qualification board of technically qualified personnel that includes at least one qualified STSM;
- Satisfactory completion of a walkthrough of a facility with a qualifying official for verifying a candidate's knowledge of and practical skills related to selected key elements.

Guidance for oral interviews and written exams is contained in DOE-HDBK-1205-97, *Guide to Good Practices for the Design, Development, and Implementation of Examinations*, and DOE-HDBK-1080-97, *Guide to Good Practices for Oral Examinations*.

For oral examinations and walkthroughs, qualifying officials or board members should ask critical questions intended to integrate identified learning objectives during qualification. Field element managers/headquarters program managers or designees must develop formal guidance for oral examinations and walkthroughs that includes:

- Standards for qualification
- Use of technical advisors by a board
- Questioning procedures or protocol
- Pass/fail criteria
- Board deliberations and voting authorization procedures
- Documentation process

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INITIAL QUALIFICATION AND TRAINING

Qualification of fire protection engineers must be conducted in accordance with the requirements of DOE O 426.1 Chg. 1, *Federal Technical Capability*. To obtain qualification as a fire protection engineer in accordance with this technical qualification standard, individuals must meet OPM standards and be classified as an Occupational Series 804 or have received a professional engineering (PE) license in fire protection engineering through a state administered NCEES (National Council of Examiners for Engineering and Surveying). They must also successfully complete the required technical competencies in this standard.

Generically, DOE O 426.1 Chg. 1 states employees “normally” will complete their assigned technical qualification program in an 18 month period. However, exception to this 18 month period may be granted to a cadre of candidates attempting to qualify under this FAQs who have not achieved a combination of engineering education and experience necessary to demonstrate knowledge, skills and abilities in fire protection engineering, including recent college graduates, graduates in engineering disciplines other than fire protection engineering, and candidates with relatively short professional experiences in fire protection engineering (e.g. 4 years or less). Commensurate with the candidate's education and experience level, qualification could take longer than 18 months. For example, a candidate who has an ABET (Accreditation Board for Engineering and Technology) engineering degree in a discipline other than fire protection and no experience in fire protection engineering may take up to 6 years of working under the direct supervision of a qualified fire protection engineer to obtain the experience, knowledge and competencies necessary to fully qualify. However, a candidate with an ABET engineering degree in fire protection engineering and four years' experience in fire protection or a candidate with an non-ABET engineering degree in fire protection and six years of fire protection experience, would be expected to qualify within 18 months. Additionally a candidate with an engineering degree in a discipline other than fire protection who has professional engineering (PE) license in fire protection engineering would be expected to qualify within 18 months. Therefore, the Supervisor and FTCP agent working with the QO shall define the appropriate time period for an individual to qualify under this FAQs based on the candidate's education, professional experience, and external fire protection certifications.

DOE personnel must participate in continuing education and training as necessary to improve their performance and proficiency and ensure that they stay up-to-date on changing technology and new requirements. This may include courses and/or training provided by:

- DOE
- Other government agencies
- Outside vendors
- Educational institutions

Beyond formal classroom or computer-based courses, continuing training may include:

- Self-study
- Attendance at symposia, seminars, exhibitions
- Special assignments
- On-the-job experience

DOE-O-426.1 Chg. 1, *Federal Technical Capability*, does not require a re-qualification for the FPE TQP. The expectation is that the qualified FPE will maintain their NCEES or state required professional development hours (PDHs) or continuing education units (CEUs). If not, the “Proficiency Points” process, specified in Appendix A, can be used to validate continuing

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training for FPE's and fire protection safety system oversight personnel. Organization or site specific fire protection continuing training may be required by FEMs/2nd Line Supervisor. Practicing FPEs shall remain conversant with the current applicable directives, industry codes and standards.

A description of suggested learning activities and the requirements for the continuing education and training program for the Fire Protection Engineering FAQs are included in Appendix A of this document. Undergraduate and graduate level fire protection courses offered by the educational institutions listed in Appendix A may be supplemented by engineering courses at accredited institutions to meet the minimum requirements of OPM Occupation Series 804. Additionally, educational and experience levels identified by organizations such as the Society of Fire Protection Engineers (SFPE) and National Council of Examiners for Engineering and Surveying (NCEES) provide fundamental competencies, education, and experience, necessary to meet minimum fire protection engineering proficiency. When utilizing SFPE criteria, fire protection engineering candidates should focus on the competencies necessary to acquire the professional membership grade and demonstrate the acquired competencies through successfully obtaining state professional licensure by passing the NCEES Principles and Practice of Engineering examination in fire protection engineering. Appendix A also includes suggested resources related to the SFPE and NCEES.

DUTIES AND RESPONSIBILITIES

The following are the typical duties and responsibilities expected of DOE personnel assigned to the fire protection engineering functional area:

- A. Serve as the subject matter expert (SME) in the area of fire protection, life safety, and fire department emergency related services.
- B. Review fire hazard analyses, assessments, and other fire safety documentation for compliance with applicable requirements.
- C. Evaluate the adequacy of site emergency services. This includes all facets of the fire department, brigade, and/or ambulance service that will respond to emergencies on site.
- D. Review the adequacy of contractor fire protection programs to ensure compliance with applicable codes, regulations, Departmental Orders, standards, guides, and accepted "Improved Risk" practices.
- E. Participate in site fire investigations and other accident/incident investigations as required.
- F. Interpret fire protection and fire department/brigade emergency services directives and make recommendations to Department management, facility representatives, contractor management, and line organizations.
- G. Represent the site and/or the Department at fire protection meetings, professional conferences, and technical standards committees.
- H. Provide oversight of the site fire protection, life safety, and fire department/brigade emergency services programs and their implementation.

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- I. Evaluate the adequacy of facility design and occupancy in accordance with applicable fire protection criteria and recommend changes as applicable.
- J. Review and evaluate requests for fire safety exemptions and equivalencies.
- K. Participate in the development of fire safety-related contract requests, the annual budget, and planning for future fire safety and fire department/brigade emergency services activities.
- L. Maintain proficiency in fire protection engineering and fire department/brigade emergency services concepts and practices through practice, education, training, and a periodic review of fire protection codes and standards that apply to DOE and its contractors.
- M. Participate in special assignments and perform assessments related to fire protection.
- N. If qualified in the safety system oversight program, conduct periodic evaluations of fire protection safety-related equipment defined in DOE facility safety basis documentation.

Position-specific duties and responsibilities for Federal fire protection engineers are contained in their office-/site-/facility-specific qualification standard and/or position descriptions.

BACKGROUND AND EXPERIENCE

The Office of Personnel Management (OPM) *Qualification Standards Operating Manual* establishes minimum education, training, experience, or other relevant requirements applicable to a particular occupational series/grade level, as well as alternatives to meeting specified requirements. Professional Certification or Engineer certification must only be referenced in an FAQS when consistent with and required by a particular OPM occupational series/grade level.

The preferred education and experience for Fire Protection Engineering personnel are:

1. Education:

Federal fire protection engineers are required to meet OPM standards and be classified as an Occupational Series 804 for the grade level of their position as a prerequisite to this standard. To be classified as an 804 series, OPM requires the use of the 800 series requirements plus demonstration of specific competencies in the fire protection engineering area, such as, but not limited to, fire protection engineering degree, professional experiences in fire protection engineering, and demonstrating professional membership grade in SFPE, as discussed previously. In-lieu-of classification as an 804 series, individuals seeking qualification under this technical qualification standard as a fire protection engineer shall be permitted to waive the 804 series prerequisite by demonstrating successful acquisition of a PE license in fire protection through a state administered professional engineering examination developed by the NCEES. The PE license in fire protection engineering is preferred, but not required to obtain qualification as a fire protection engineer under this technical qualification standard. Individuals who are assigned safety system oversight of specific fire protection systems, but perform no other fire protection engineering responsibilities, should be classified under another OPM engineering series such as "General Engineer" (801) or "Safety Engineer" (803). Individuals, who are already classified as an 804 or can demonstrate a previous 804

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classification, are encouraged to also seek professional registration but are not required to as a prerequisite to this standard.

2. Experience:

Industrial, military, Federal, state, or other directly-related background that has provided specialized experience in fire protection engineering. Specialized experience can be demonstrated through possession of the competencies outlined in this standard. The fire protection engineering experience should be evaluated by the QO as part of the qualification process.

3. External Certifications:

External certifications in the area of fire protection (such as: FP PE License; National Institute for Certification in Engineering Technologies (NICET), Certified Fire Protection Specialist (CFPS), etc.) are welcomed and encouraged at DOE. These external certifications should be evaluated by the QO during the qualification process and may be used to provide justification for approval of the appropriate fire protection engineering competencies (Section II) in this qualification standard.

REQUIRED TECHNICAL COMPETENCIES

The PE license in fire protection engineering is preferred but not required to obtain qualification as a fire protection engineer under this technical qualification standard. The competencies contained in this standard are distinct from those competencies contained in the General Technical Base (GTB) Qualification Standard. All fire protection engineering personnel must satisfy the competency requirements of the GTB Qualification Standard prior to or in parallel with the competency requirements contained in this standard. Each of the competency requirements defines the level of expected knowledge and/or skill that an individual must possess to meet the intent of this FAQS. Each competency requirement is further described by supporting knowledge and/or skill statements that describe the intent of the competency statement. In selected competencies, expected knowledge and/or skills have been designated as “mandatory performance activities.” In these competencies, the actions are not optional.

Section I (Competencies 1 through 6) lists the DOE fire protection competencies that include the key elements of a DOE fire protection program. Section II (Competencies 7 through 11) lists the core fire protection engineering competencies required for all fire protection engineers. Those candidates who have received a professional engineering license in fire protection engineering, discussed in the “Initial Qualification and Training” section of the standard, would normally be expected to already have obtained the competencies in section II. Sections I and II are required for qualification as an FPE under this standard. Section III (Competencies 12 and 13) lists the safety system oversight competencies for FPEs or other engineers. Section III applies to engineers who have been assigned safety system oversight for specific fire protection systems. The Department recognizes that several small sites may not have a resident fire protection engineers and in this case other engineers, including facility representatives, may be used to conduct safety system oversight of fire protection systems. Therefore, competency 13 in this FAQ is a limited competency for this cadre of engineers who are assigned safety system oversight for specific fire protection system(s) but have no other fire protection responsibilities.

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Note: When regulations, DOE directives, or other industry standards are referenced in this FAQs, the most recent revision should be used. It is recognized that some Federal FPEs may oversee facilities that use predecessor documents to those identified. In those cases, such documents should be included in local qualification standards.

Section I. DOE FIRE PROTECTION COMPETENCIES

1. **Fire protection engineers must demonstrate a working level of knowledge of the fire protection related aspects of the following directives (or their successor documents), codes, standards, and handbooks:**
 - DOE Order 151.1C, *Comprehensive Emergency Management System*
 - DOE Guide 151-1.1A, *Emergency Management Fundamentals and the Operational Emergency Base Program*
 - DOE O 420.1C, *Facility Safety*
 - DOE O 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*
 - DOE-STD-1066-2012, *Fire Protection Design Criteria*
 - 10 CFR 851, *Worker Safety and Health Program*
 - DOE-HDBK-1081-94, *Primer on Spontaneous Heating and Pyrophoricity*
 - DOE-HDBK-1163-2003, *Integration of Multiple Hazard Analysis Requirements and Activities*
 - *Most current versions of NFPA 11, 13, 15, 20, 24, 25, 30, 68, 69, 72, 80, 90A, 92, 101, 204 and 801 (This list is not all inclusive. Other NFPA Codes may be included based on engineering responsibilities or specific site hazards.)*
 - *SFPE Handbook of Fire Protection Engineering*
 - *NFPA Fire Protection Handbook*
 - *Local Building Code (Sections applicable to fire safe building design and construction)*

Supporting Knowledge and/or Skills

- a. Describe the essential fire safety principles, requirements, relationships, and importance of these Orders, guides, and standards with respect to fire protection issues.
- b. Discuss the contractor's fire protection responsibilities associated with implementation of these directives.
- c. Describe the role of the Department's fire protection engineers with respect to implementation of the fire protection requirements of these directives.
- d. Describe the fundamental requirements that apply to a DOE fire department or brigade.
- e. Describe the relationship between fire and life safety provisions of these documents with other facility provisions (e.g., security, nuclear safety, criticality safety, confinement ventilation, etc.).

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2. **Fire protection engineers must demonstrate a working level knowledge of the essential elements of a documented fire safety program.**

Supporting Knowledge and/or Skills

- a. Explain the importance of a comprehensive fire safety program.
- b. List some of the policies, practices, and procedures that are encompassed by a fire protection program.
- c. Perform a review of the contractor's documented fire safety program, and develop recommendations for the field element manager approval.
- d. Review the field element oversight plan to ensure fire protection is reflected in the assessment plans. Ensure that the oversight plan is consistent with DOE fire protection directives. Where appropriate, help develop milestones and objectives for the contractor's performance and assist in evaluating the contractor's performance against site specific objectives.

3. **Fire protection engineers must demonstrate a working level of knowledge of the requirements for fire protection and life safety related design control processes identified in DOE directives.**

Supporting Knowledge and/or Skills

- a. Describe the key elements of the design, construction, and acceptance process as practiced on site.
- b. Identify who may conduct fire protection system and/or component design verifications.
- c. Describe the conditions to be considered when inspecting and testing fire protection and life safety systems to verify or validate design features.
- d. Describe the key elements of facility design that are important to effective emergency response.
- e. Describe the issues and concerns to be considered with respect to integration with other safety and security elements.
- f. Describe activities, key characteristics, and requirements of a performance based design/evaluation process, including application of fire modeling.

4. **Fire protection engineers must demonstrate a working level knowledge of fire protection analysis including fire hazards analysis (FHAs), exemptions and equivalencies, confinement ventilation, nuclear criticality, smoke management systems and fire dynamics.**

Supporting Knowledge and/or Skills

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- a. Describe the purpose, content, and key attributes of a comprehensive FHA, including when an FHA is required to be written, the level of personnel qualified to write an FHA, and how often an FHA is required to be revised.
- b. Perform a review of an existing FHA.
- c. Define the "equivalency concept" and the "exemption process" delineated in NFPA 101 and DOE directives.
- d. Review an existing exemption and equivalency.
- e. Explain the concept of confinement ventilation along with the associated systems and components, and typical fire protection measures.
- f. Describe interactions of fire suppression media with combustible metals and fissile materials.
- g. Describe the applications, criteria, types, and components of smoke management systems.
- h. Explain the concepts of fire dynamics including: fire behavior; fire growth; combustion; plume entrainment; material properties; material compatibility; and heat transfer.

5. Fire protection engineers must demonstrate a working level knowledge of a fire department/brigade operations and the "baseline needs assessment."

Supporting Knowledge and/or Skills

- a. Describe the intent of a "baseline needs assessment".
- b. Describe the fundamental responsibilities of a DOE fire department or brigade.
- c. Describe the activities that are typically performed by a fire department/brigade at the scene of a fire or other emergency.
- d. Identify some of the NFPA standards that are applicable to a DOE fire department/brigade.
- e. Describe the integration of emergency service providers with other site emergency management in the incident command or unified command structure.
- f. Discuss the principles and methodologies of fire investigation using NFPA 921, *Guide for Fire and Explosion Investigations*

6. Fire protection engineers must demonstrate at the working level the ability to conduct fire protection and emergency services assessments, develop corrective actions and recommendations, communicate assessment results verbally and in writing, and develop supporting results.

Supporting Knowledge and/or Skills

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- a. Describe the purpose of a comprehensive compliance-based and performance-based fire safety assessment.
- b. Describe the difference between programmatic and facility fire safety assessments.

Mandatory Performance Activities:

- a. Lead a program assessment of a site fire protection program.
- b. Conduct a comprehensive compliance-based and performance-based fire safety assessment.
- c. Formally document a comprehensive assessment report and orally communicate the results of the assessment to DOE and contractor management.

Section II. FIRE PROTECTION ENGINEERING COMPETENCIES

7. Fire protection engineers must demonstrate a working level knowledge of typical fire suppression systems.

Supporting Knowledge and/or Skills

- a. Identify the various types of fire protection systems and their suitability for protecting typical site fire hazards.
- b. Identify the applicable NFPA code or standard.
- c. Identify some of the fundamental design principles of each system including interface to other systems (e.g. heating, ventilating, and air conditioning (HVAC), air, electrical power, process interlocks, etc.).
- d. Identify some of the basic inspection, test and maintenance requirements for typical systems.

8. Fire protection engineers must demonstrate a working level knowledge of a fire water distribution system.

Supporting Knowledge and/or Skills

- a. Describe the various components of a fire water distribution system.
- b. Identify the applicable NFPA standards that apply to a fire water distribution system.
- c. Identify some of the more fundamental design principles associated with a fire water distribution system and water supplies (storage tanks, wells, lakes, etc.) including interface to other systems (e.g. electrical and supervisory controls, process interlocks, etc.).

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- d. Identify some of the basic inspection, test, and maintenance requirements for a fire water distribution system.
- e. Discuss the methodologies and considerations when calculating fire flow demands for sprinklered and nonsprinklered facilities.

9. Fire protection engineers must demonstrate a working level knowledge of a fire alarm and signaling system.

Supporting Knowledge and/or Skills

- a. Describe the various components of a fire alarm and signaling system.
- b. Identify the applicable NFPA code that applies to a fire alarm and signaling system as well as other standards that are applied in conjunction with it.
- c. Identify some of the fundamental design principles associated with a fire alarm and signaling system including interface to other systems (e.g. HVAC, air, electrical power, process interlocks, etc.).
- d. Identify some of the basic inspection, test, and maintenance requirements for a fire alarm and signaling system.

10. Fire protection engineers must demonstrate a working level knowledge of fire barriers and their related appurtenances.

Supporting Knowledge and/or Skills

- a. Define a fire barrier and describe typical devices that provide protection for openings therein.
- b. Identify the applicable NFPA standards that apply to fire barriers, fire doors, and fire dampers.
- c. Identify some of the basic inspection, test and maintenance requirements for fire barriers, penetration seals, fire doors, and fire dampers.

11. Fire protection engineers must demonstrate a working level knowledge of the life safety concepts.

Supporting Knowledge and/or Skills

- a. Describe the basic elements of a means of egress.
- b. Describe how occupancy considerations influence emergency egress requirements.
- c. Describe several emergency egress issues on site and how they have been resolved.
- d. Identify how life safety concepts integrate with concepts of other safety and security disciplines.

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- e. For those DOE sites with underground facilities, describe how life safety requirements for them differ from facilities on the surface. Identify the NFPA and other codes/standards that are applicable to underground facilities.

Section III. SAFETY SYSTEM OVERSIGHT OF FIRE PROTECTION SYSTEM(S) COMPETENCIES

- 12. Engineers (including fire protection engineers and safety system oversight personnel) who are assigned safety system oversight for specific fire protection system(s) must demonstrate a working level knowledge of the system(s) they have assigned oversight responsibility.**

Supporting Knowledge and/or Skills

- a. Discuss and characterize the role of fire protection systems within the content of technical safety basis documentation (e.g. documented safety analysis, technical safety requirements, safety evaluation report, and FHA).
- b. Describe the various components of the fire protection systems, including the necessary support systems (e.g. water supply, fire alarm, electrical supply, etc.).
- c. Identify the more fundamental design principles associated with a fire water distribution system.
- d. Identify the basic inspection, test, and maintenance requirements for a fire water distribution system.
- e. Identify the applicable NFPA codes or standards that apply to the fire protection systems and water distribution systems, including design and inspection, testing, and maintenance standards.
- f. Identify the fundamental design principles associated with a fire alarm and signaling system and how the alarm system is considered a support system to a suppression system.
- g. Identify the fundamental design principles, including pertinent calculations for each system.
- h. Identify the basic inspection, test and maintenance requirements for each system.

Mandatory Performance Activities:

- a. Conduct a comprehensive, in-plant assessment of assigned fire related system(s) addressing the operability, functionality, and reliability of each system and its necessary support system.
- b. Formally document and communicate the results of the assessment to DOE and contractor management.

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- 13. Engineers who are assigned safety system oversight for specific fire protection system(s) but have no other fire protection responsibilities must demonstrate a familiarity level knowledge of the DOE fire protection program.**

Supporting Knowledge and/or Skills

- a. Discuss the contractor's fire protection responsibilities associated with the implementation of the DOE directives listed in competency 1 of this FAQS.
- b. Describe the fundamental requirements and system-related considerations that apply to a DOE fire department or fire brigade.
- c. Describe the key elements of the design, construction, and acceptance process as practiced on site.
- d. Identify who may conduct fire protection system and/or component design verifications, including inspection, testing, and maintenance of the system.
- e. Describe the conditions to be considered when inspecting and testing fire protection systems to verify or validate design features.
- f. Describe the key elements of facility design that are important to effective emergency response.
- g. Identify the various types of fire protection systems and their suitability for protecting typical site fire hazards.
- h. Define a fire barrier and describe typical devices that provide protection for openings therein.
- i. Describe the various components of a fire alarm and signaling system.
- j. Describe the basic elements of a means of egress and how a fire protection system may be considered relevant to life safety.
- k. List some of the policies, practices, and procedures that are encompassed by a fire protection program that relate to safety system oversight.

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APPENDIX A

CONTINUING EDUCATION, TRAINING AND PROFICIENCY PROGRAM

This standard does not require requalification (See FTCP Issue Paper FTCP 08-002 on the FTCP website. Document decisions provide a summary of positive Requalification recommendations to the FTCP).

Headquarters or field element managers must ensure the following:

1. Establish expectations related to the performance of duties and responsibilities in this FAQS, considering regulatory and/or contractual requirements as appropriate.
2. Identify specific continuing training requirements in the site/office/position specific qualification standard(s) or procedures.
3. Approve all established continuing training requirements related to defense nuclear facility safety oversight as determined for their office or site.

The following list represents suggested continuing education, training, and other opportunities that are available for DOE personnel after completion of the competency requirements in this technical FAQS. It is extremely important that personnel involved with this program maintain their proficiency primarily by regularly demonstrating their competency through on-the-job performance, supplemented with continuing education, training, reading, or other activities, such as, workshops, seminars, and conferences. The list of suggested activities was developed by the SMEs involved in the development of this FAQS and is not all-inclusive.

Based on the knowledge and experience of the SMEs, it is suggested that the following activities support the maintenance of proficiency in the fire protection engineering functional area after completion of the competencies in the standard and other requirements of the TQP.

LIST OF CONTINUING EDUCATION, TRAINING, AND OTHER ACTIVITIES

1. Continuing technical education and/or training covering topics directly related to the fire protection engineering area as determined appropriate by management. This may include courses/training provided by DOE, other government agencies, outside vendors, or local educational institutions. Continuing training topics should also address identified weaknesses in the knowledge or skills of the individual personnel.
 - a. Undergraduate and graduate-level courses offered by:
 - California Polytechnic State University
 - Eastern Kentucky University
 - Oklahoma State University
 - University of Maryland
 - Worcester Polytechnic Institute
 - Other accredited institutions (such as community colleges)

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- b. Topic-specific courses offered by:
 - DOE, including Safety Basis Academy
 - DOE operating contractors
 - National Fire Protection Association (NFPA)
 - Society of Fire Protection Engineers (SFPE)
 - FM Global
 - U.S. Fire Academy (USFA)
 - American Fire Sprinkler Association (AFSA)
 - Other Federal and Non-Federal agencies
2. Attend seminars, symposia, or technical meetings related to fire protection engineering, such as:
 - a. Annual DOE/Contractor Fire Safety Workshop
 - b. NFPA annual and fall meetings
 - c. NFPA Technical Standards committee meetings
 - d. American Society for Testing and Materials E-5 committee meetings
 - e. Other industry meetings
3. Engage in self-study of new regulations, requirements, or advances related to fire protection engineering.
4. Participation in practical exercises such as emergency or operational drills, simulations, or laboratory-type exercises.
5. Specific continuing training requirements shall be documented in Individual Development Plans (IDPs).

PROFICIENCY POINTS

DOE Federal fire protection engineers, covered under this FAQS, and Federal engineers who are assigned safety system oversight of specific fire protection systems but provide no other related fire protection engineering oversight functions, covered under this FAQS, shall maintain proficiency points every three years after the initial qualification. DOE program managers, site managers or NNSA Deputy Administrators shall document the qualification and proficiency point process that shall, at a minimum include the following:

1. Items added to this FAQS since the individual's last qualification or requalification.
2. A combination of written examinations, oral examination, or facility/site walkthroughs, as necessary, to demonstrate competency on the new material and those areas from the initial qualification where the individual has not demonstrated ongoing experience during the past five years.
3. A minimum of thirty (30) proficiency points shall be earned in each 3 year period after qualification for a Federal fire protection engineer. A minimum of ten (10) proficiency points shall be earned in each 3 year period after qualification for engineers who are NOT fire protection engineers but are assigned safety system oversight of specific fire protection system(s).

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The following sections provide guidance for assigning proficiency points. Additional activities of a similar nature related to fire protection engineering duties may be assigned points as agreed in IDPs.

Active participation in fire protection duties:

- 1 point per year for each 500 work hours performing fire protection duties
- Not to exceed 12 points in 3 years

Participation in fire protection assessments/evaluations

- 1 point for each assessment of 2 weeks duration on site
- Assessments lasting less than 2 weeks may be rolled-up into 2 week totals
- Not to exceed 6 points in 3 years

Maintenance of Professional Engineer (PE) registration in fire protection engineering

- 1 point per year

Pass Engineer-In-Training (EIT) exam or PE exam in fire protection

- 6 points per exam
- One time only

Membership in fire protection organizations such as NFPA, SFPE, DOE Fire Safety Committee (FSC)

- 1 point per year per organization
- Not to exceed 6 points in 3 years

Active member of technical committee in field of fire protection (NFPA, ASTM, SFPE)

- 1 point per year per committee
- Not to exceed 6 points in 3 years

Chair technical committee in field of fire protection

- 1 point per year
- Not to exceed 3 points in 3 years

Professional publications on fire protection topics

- 1 point per publication
- Not to exceed 3 points in 3 years

Successfully complete undergraduate and graduate-level fire protection courses offered by:

- California Polytechnic State University
- Eastern Kentucky University
- Oklahoma State University
- University of Maryland
- Worcester Polytechnic Institute
- Other accredited institutions
- 2 point per credit hour in year earned
- Not to exceed 18 points in 3 years

Successfully complete fire protection courses/seminars/certifications offered by:

- DOE
- DOE operating contractors

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- NFPA
- SFPE
- Factory Mutual Research Corporation
- NICET in fire protection
- Other Federal and Non-Federal agencies
- 2 points per day of training or 1 point per CEU
- Not to exceed 12 points in 3 years
- 1 point per year for maintaining CFPS

Attend professional fire protection conferences, workshops and meetings, such as:

- Annual DOE/Contractor Fire Safety Workshop
- NFPA annual and fall meetings
- 1 point per day of participation
- Not to exceed 18 points in 3 years

Presentations at fire protection conferences, meetings, seminars, courses

- 2 point per presentation
- Not to exceed 12 points in 3 years

Suggested resources:

National Fire Protection Association
1 Battery march Park
Quincy, Massachusetts
USA 02169-7471
<http://www.nfpa.org>

Society of Fire Protection Engineers
7315 Wisconsin Avenue, Suite 620E
Bethesda, MD 20814
<http://www.sfpe.org>

National Council of Examiners for Engineering and Surveying
P.O. Box 1686
280 Seneca Creek Road
Clemson, SC 29633-1686 U.S.A.
<http://www.ncees.org/>

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CONCLUDING MATERIAL

Review Activity:

EM
NNSA
HSS
Office of Science
NE
SC

Preparing Activity:

NNSA

Project Number:

TRNG-00XX

Field and Operations Offices:

CBFO
CH
ID
OH
ORP
RL
SR

Site/Field Offices:

Argonne
Brookhaven
Fermi
Kansas City
Livermore
Los Alamos
Nevada
NPO (National Production Office) Pantex
Savannah River
Sandia
NPO (National Production Office) Y-12